

**TITLE OF INVENTION:**

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**Residence:** Washington, D.C.  
**Title:** Billiard Training Ball

**CROSS-REFERENCE TO RELATED APPLICATIONS:** Not Applicable

**STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT:** Not Applicable.

**REFERENCE TO SEQUENCE LISTING, A TABLE, OR A COMPUTER PROGRAM LISTING COMPACT DISC APPENDIX:** Not Applicable.

**BACKGROUND OF THE INVENTION:**

(1) The U.S. patent code classifications that are applicable to this new invention:

Class 473: Games Using Tangible Projectile

Subclass 1: Billiards or Pool

Subclass 2: Practice device or device to aid in aiming cue or cue ball during shots.

Subclass 52: Ball; Subject matter relating to the structural details of a generally spherical member (i.e. a ball) which is spherically adapted for use in playing a game of billiards or pool.

(2) The present invention pertains to the field of sports generally referred to as “billiards,” and specifically to an improved type of “cue ball” for training purposes.

(3) Billiards is widely recognized as comprising all games played on flat level tables edged with rails or cushions using balls struck by cue sticks. The cue sticks, balls, and tables can all vary in size; the table may include pocket(s) or none at all. The cue ball is distinctive and essential to all billiard games, since it is initially struck by the cue stick during play. Cue balls are typically manufactured in an opaque white color, and are

usually made the same size and weight as all the other balls of the same set designated for a particular game.

(4) The origin of billiards is obscure, although many historians attribute its roots to stem from Europe circa late 17th century or perhaps even earlier. Over the years, billiards has evolved into branches of many different games. Today, billiards is divided into two basic disciplines: “pocket billiards,” (i.e., billiard games played on tables with pockets); and “carom billiards,” (i.e., billiard games played on tables without pockets). Pocket billiards is a popular form of recreation called “pool” that spans across the United States and many other countries throughout the world. Another prevalent pocket billiard game is “snooker” which is devoutly played in the United Kingdom and usually in other countries that have or had British influence. Carom billiards has considerable acceptance with participation in diverse nations on several continents as well. Carombole or carombola, French billiards, three-cushion billiards, or just simply “billiards” are some of the common names by which carom billiards is called.

(5) To partake of billiard games with proficiency, a player should possess good physical dexterity and develop good hand-eye coordination, not to mention have clever strategy. It is paramount in any cueing sport or game to be able to swing a cue stick and then strike a cue ball with accuracy, in order to produce a desired result. The desired result in both pool and snooker is usually to pocket an object ball, but it may simply be to direct the cue ball to a specific location. In carom billiards, of course, no pocketing of balls is involved since carom tables contain no pockets; simply shooting at the cue ball to contact another ball or a rail are the usual cases. In any event, developing adeptness of striking the cue ball and applying spin when necessary, compounded by a consistency to do so are key factors to successful cueing.

(6) In billiards, as with any sport involving balls and other moving objects, the laws of physics and geometry govern or describe actions and outcomes during play. Although a skilled billiard player does not necessarily have to formally study science and/or math per se to become as such, he or she does have to at least intuitively, if not consciously, learn both the subtle and dramatic effects of collisions of the cue stick with the cue ball, the cue ball with other balls, and balls with cushions. How friction affects the way balls roll on the cloth of the table, or simply how humidity and temperature

affect the playing equipment are further learning considerations. After many hours of practice, a player can program the brain through trial and error, adjust to the environment, and improve skills without realizing it. This natural learning process does not preclude that some players may learn faster if proper training methods, means, and scientific and mathematical knowledge are availed to them.

(7) To more fully fathom the fundamental elements of my billiard training ball, it is necessary to elaborate upon a critical aspect of billiard balls in motion, namely “spin.” Spin is called “english” in the U.S. or “side” (short for sidespin) in the U.K. If a cue stick horizontally strikes a cue ball, parallel with the table and precisely dead center, the cue ball will initially be directed forward with no rotational spin. If the cue ball is again centrally struck, but now either at the bottom or top, no sideways rotational spin will be generated, only spin conveyed toward the cue stick or away from it, respectively. The backward motion of the cue ball is commonly called “draw,” and “low” or “bottom” english in the U.S. and “screw” in the U.K. The forward motion is known as “follow,” “topspin,” and also as “top” or “high” english in the U.S. The preponderance of players concur that center-hits (refer to Fig. 2) are the ideal way to strike the cue ball for the greatest likelihood of it reaching the desired target, for reasons to be elucidated later. In many instances, billiards requires that the cue ball be driven in a manner that a center-ball hit cannot accomplish. In those situations, left- or right-hand english must be administered to the cue ball so as to alter its natural heading and/or manner of rolling, especially when the cue ball glances off the rails. In pool, this action plan has taken on the slang phrasing of “playing position” or “setting up” with the cue ball for subsequent play, in order to gain strategic advantage. A master player adroitly incorporates striking the cue ball left or right in varying degrees of high or low in order to achieve such a goal. As will be explained in the following text, it is frequently this imparting of particularly left or right spin (sidespin) on the cue ball that can produce an unwanted or undesirable outcome, for the novice and champion alike.

(8) Another crucial element that is necessary to fully grasp my billiard training ball is that of the effect of a cue stick colliding with a cue ball, aptly described in pool as “deflection” or more colloquially as “squirt” (refer to Figs. 3, 4, & 5). Attempting to create sidespin by striking the left side of the cue ball forces it to veer slightly to the right,

and vice versa. Attempting to create spin by centrally striking the top of the cue ball forces it downward into the table, and vice versa. These up and down vertical deflections are neutral or negligible to the accuracy of hitting the target, and will be disregarded in this treatise. Deflection noted herein should be understood as lateral or sideways deflection.

(9) Deflection is an oblique linear path away from parallel with the cue stick that the cue ball takes after being struck on the side by the tip of the cue stick. It may also be described as the action of the tip pushing the cue ball to the side after their collision, or alternately as the action of the cue ball pushing the tip and cue stick to the side. A physicist might describe deflection as a mutual sideways vector force between the tip of the cue stick and the cue ball without motive imputed to either one. In this balanced scientific logic, deflection obeys the Law of Conservation of Momentum and Newton's Second Law of Motion. Nonetheless, this "squirt" effect propels the cue ball off to the side on a heading that is slightly aslant from the direction that the player may have originally intended. When contacting the cue ball farther on the side (i.e., more eccentrically off-center) in order to yield even more spin, the amount of deflection will increase (refer to Figs. 3 & 4). Bob Jewett, a scientist and accomplished billiard player who authoritatively writes about the science of billiards, assented in the September, 2002 issue of *Billiards Digest* that, "As far as we know, two tips of English will produce twice the squirt angle of one tip."

(10) Phil Capelle authored a book entitled *"Play Your Best Pool"* in which he presents the results of a controlled experiment that he conducted to measure deflection. He concluded that hitting the cue ball twice as far off-center can produce anywhere from two to three times as much deflection, depending on the speed of stroke with the cue stick.

(11) Capelle deduced from his trials that swinging the cue stick faster increases its momentum and the force applied to the cue ball when struck, and consequently the amount of cue ball deflection. Jewett in the aforementioned *Billiards Digest* article cites Mike Page who observed in his experiments that there is a considerable change in squirt with the speed of shot. To the contrary however, Ron Shepard, the author of *"Everything You Always Wanted to Know About Cue Ball Squirt, But Were Afraid to Ask,"* from his

own calculations disagrees. Irrespective of which component is in fact a contributor, a hard blow to the side of the cue ball from a cue stick will produce noticeable or even startling squirt.

(12) There are other factors that influence deflection to varying degrees. The mass of the cue stick shaft, mostly within a few inches of the tip does so significantly; and to a lesser degree the size, shape, and hardness of the tip. Experts in the field undeniably agree that these and any additional factors are not as impacting as the above-mentioned striking location on the cue ball. Jewett notes in his article that, “Squirt has been found to vary due to many factors. The largest effect is from the amount of tip offset (side spin).”

(13) Researchers in the field have also determined that the actual angle of lateral deflection can be up to four degrees from the direction of the cue stick. Across the entire length of an eight-, nine-, ten-, or 12-foot billiard table, this angle, albeit small, can translate into several inches by which a player can miss the intended target. In game action, when continually only a small fraction of an inch may be critical to hitting the target or not, serious attention must be given to any amount of deflection. Since deflection angles are very acute ( $\leq 4$  degrees), Figs. 3, 4, & 5 illustrate slightly exaggerated deflection angles for ease of distinction.

(14) It is important to note that the angle of deflection has little significance if the intended target or object ball is very close, within a few inches of the cue ball. Conversely, when the target is far away from the cue ball, several or many feet away, even though the angle of deflection basically remains constant, the cue ball with every inch traversed will diverge from its target more and more (refer to Fig. 5).

(15) I stated above that the deflection angle “basically remains constant” because the resultant direct trajectory of the cue ball while in motion can be altered. The friction produced by the spinning cue ball on the cloth of the billiard table will make the cue ball swerve. For example, a baseball drastically rotating after leaving the pitcher’s hand will slice through the air and curve from the friction of the air, in much the same manner as a cue ball will curve on the billiard table. Usually only excessive spin across several feet can dramatically produce this effect, “massé” strokes notwithstanding. (A massé shot is an atypical billiard stroke where the cue stick is directed downward upon the cue ball,

even perpendicular to the table, and produces an immediate exaggerated spin.) Since the cue ball is always initially set into a linear motion after being struck, for the purpose of this discourse, subsequent cue ball swerve from spin or massé will be disregarded, and the trajectory of deflection will rightly be considered as constant. Hence, an essential technique for increasing accuracy of all shots, especially medium- to long-range, is to limit sideways cue ball deflection while achieving a minimum yet effective amount of sidespin upon the cue ball.

(16) Having described deflection or squirt in laymen's terms, one may better appreciate the difficulty a billiard player encounters striking a cue ball to impart sidespin and allow for deflection, while producing the calculated result.

(17) It is interesting to note that as yet, there is no way to distill the governing scientific principles and formulas into a foolproof aiming system when applying sidespin to the cue ball; the variables are too complex. The best one can do is teach the human brain to limit some, if not one of the major variables (i.e., deflection), in order to increase cueing accuracy. It would be greatly advantageous to the cueist to be able to practice in such a controlled and effectual manner. This is where my new training ball could be engaged in a successful guiding role. Using such an ideal training ball over sufficient practice time should hone the aiming/striking technique within the mind and body. When similarly striking a standard cue ball during play, deflection will thereby also be limited, thus increasing the percentage of hitting the mark at all times.

(18) Favorably, my billiard training ball is versatile in design to be adapted for use with billiard games played on any table, both with and without pockets, since the fundamental structural elements are applicable to any size cue ball. The scope of billiard players that would benefit from this novel training ball is broad in skill level of the players and global in geography.

(19) For those wishing to gain further insight into the fundamentals and science of billiards, refer to the following publications (listed in alphabetical order by the primary author's surname). Page numbers cited relate specifically to the problematic effect of deflection.

Robert Byrne, "*Byrne's Advanced Technique in Pool and Billiards*," Harcourt  
Brace & Company 1990, Orlando, FL, page 68.

Phil Capelle, *"Play Your Best Pool,"* Billiards Press 1995, Midway City, CA, pages 92-93.

Arthur Cranfield & Laurence S. Moy, *"Essential Pool,"* Lyons Press 2002, Guilford, CT, pages 98-99.

George Fels, *"Advanced Pool,"* Contemporary Books 1995, Lincolnwood, IL, page 30.

Joe Hardesty, *"Simply Pool,"* Burford Books 1998, Springfield, NJ, pages 56-57.

Bob Jewett, *Billiards Digest*, September, 2002, Luby Publishing Inc., Chicago, IL, pages 24-25.

Gerry Kanov & Shari Stauch, *"Precision Pool,"* Human Kinetics 1999, Champaign, IL, pages 68-69.

Jack Koehler, *"The Science of Pocket Billiards,"* Sportology Publications 1995, Laguna Hills, CA, pages 69-71.

Ewa Laurance & Thomas C. Shaw, *"Idiot's Guide to Pool and Billiards,"* Alpha Books 1999, Indianapolis, IN, pages 197-200.

Jeanette Lee & Adam Scott Gershenson, *"The Black Widow's Guide to Killer Pool,"* Three Rivers Press 2000, NY, NY, page 79.

Steve Mizerak, *"Winning Pool Tips,"* Contemporary Books 1995, Lincolnwood, IL, pages 8-9.

Willie Mosconi, *"Willie Mosconi on Pocket Billiards,"* Three Rivers Press 1959, NY, NY, page 42.

Ron Shepard, *"Amateur Physics for the Amateur Pool Player,"* Self-published 1997, Argonne, IL, pages 3,4, & 11-13.

Ron Shepard, *"Everything You Always Wanted to Know About Cue Ball Squirt, But Were Afraid to Ask,"* Self-published 2001, Argonne, IL, pages 1-19.

Mike Sigel, *Billiards Digest*, August, 2002, Luby Publishing Inc., Chicago, IL, page 18.

(20) Prior to my billiard training ball, a number of aiming devices (nine referenced) and training cue balls (six referenced) have been developed and patented. The aiming devices are not directly relevant to the present invention since they rely on

external means independent from a cue ball. Nonetheless, these patents are later referenced in this document.

(21) There are training cue balls found in the prior art that are more directly related to the present invention. Some of these cue balls are designed to work in tandem with a training object ball as an aiming system, such as U.S. Pat. Nos. 5,401,215, 6,364,783, and 5,716,283. In a primary functional sense; however, these inventions do not transcend the bounds of two-dimensional targeting.

(22) U.S. Pat. No. 5,401,215, issued to Pfof in 1995, strictly incorporates an object ball coated with a surface pattern of colored dots at which to aim.

(23) U.S. Pat. No. 6,364,783, issued to Kellogg in 2002, employs a transparent cue ball and object ball system for sighting through both balls. While this system “secondhandedly” incorporates three dimensions, it mostly uses two-dimensional leveling points on each ball’s surface and it neglects the matter of deflection.

(24) U.S. Pat. No. 5,716,283, issued to Simpson in 1998, also does not offer a remedy to limit deflection after aiming and striking since it too uses surface patterns on both the cue ball and object ball. This document does, nevertheless, acknowledge the effect of deflection from striking the cue ball off-center. In “*Exercise 5*” of the “*Examples*” section it states that the cue ball “squirts” to the side when applying sidespin and warns that, “The addition of a spin or “english” component to the motion of the cueball complicates the shot and therefore is to be avoided unless absolutely necessary.”

(25) There are two solo training cue balls noted in the prior art that also exhibit only surface markings on the circumference of the cue ball: U.S. Pat. No. 3,993,305 issued to Nicholson in 1976 and U.S. Pat. No. D393,672 issued to Clay in 1998.

(26) Two additional billiard balls in the prior art utilize distinctive systems in order to enhance targeting. The contraption of U.S. Pat. No. 5,322,475, issued to Irvin in 1994, has a level inserted into the cue ball and a perpendicular target attached at which to aim when applying spin. The contrivance of U.S. Pat. No. 3,630,601, issued to Lehovc in 1971, has a photoelectric lighting system implanted in the interior of a billiard ball for illustration of how balls roll. While unique and curious, these two inventions also do not directly address the effect of deflection after striking the cue ball.

(27) It is important to note that in the prior art there is U.S. Pat. No. 4,116,439, issued to Chavarria and Foster in 1978, that describes within its text the “molding process” to place opaque objects in the center of transparent billiard balls. The document’s *“Summary of the Invention,”* states, “It has been found that using the techniques of this invention and the mold apparatus, virtually any opaque may be placed at the center of the transparent sphere, so that the ball may have particular use, for example, for advertising promotion of products or simply for providing game balls having a distinctive appearance.” While this patent in the *“Summary of the Invention”* envisions “particular use” for a centered opaque object within a transparent ball, it does not specifically cover a use for “training” or “aiming” within the *“Claims”* or any other sections of the patent.

(28) Two other inventions tangentially related to transparent balls exist which contain imbedded objects: U.S. Pat. Nos. 5,649,874 issued to Headford in 1997 and 6,217,806 issued to Baxley in 2001. These two patents solely relate to the manufacturing process of such transparent balls, and do not encompass any other purpose.

(29) All of the prior art have not provided a remarkable method for aiming, in a prevailing three-dimensional sense, with regards to initiating sidespin and limiting deflection to the cue ball. The prior inventions rely almost entirely upon coaching marks inscribed upon the circumference of the cue ball in two dimensions. Some schematic art referenced above will show you where to aim by centrally striking the cue ball, or where to aim on the surface of the cue ball in order to independently apply sidespin without adjusting for deflection; however, none will show you where to definitively aim when taking into account the two parameters of both spin and deflection.

(30) The constraints of the prior art have led to its inability to successfully instruct a billiard player on how to effectively impart sidespin and limit cue ball deflection in order to achieve the desired result.

(31) A further shortcoming of prior billiard training balls is that they always have to be adjusted on each and every shot, so as to re-align their two-dimensional surface patterns. They fail to allow a player to practice in an uninterrupted manner. My training ball eliminates the necessity of such bothersome re-orientation and constantly reveals the optimum zone at which to aim when applying spin, if desired. The logical assumption is

that the inner core would be made spherical, creating a uniform geometric shape at which to aim from any orientation of the cue ball after it comes to rest.

(32) U.S. Patent Document References:

Training Billiard Cue Balls and Object Balls:

3,993,305	Donald Nicholson	11/23/76	473/2
5,322,475	Barry L. Irvin	06/21/94	473/52
5,401,215	R. Fred Pfost	03/28/95	473/2
5,716,283	Thomas E. Simpson	02/10/98	473/2
6,364,783	Jack Kellogg	04/02/02	473/2
D393,672	David Clay	04/21/98	21/204

Billiard Aiming Devices:

3,411,779	Donald K. McGowan	11/19/68	473/2
3,630,601	Kurt Lehovec	12/28/71	473/125,200
3,711,091	James E. Dixon	01/16/73	473/2
3,843,120	Vero Ricci	03/04/03	473/2,52
3,947,026	Robert J. Scoutten	03/30/76	473/236
4,151,990	Frederick G. Josenhans	05/01/79	473/2,268,279
4,268,033	Paul E. Fontaine	05/19/81	473/2
5,597,360	Philip J. Freedenberg	01/28/97	473/2
6,527,647	Robert W. Ringeisen	03/04/03	473/2,52

Molding Devices for Transparent Balls:

4,116,439	Robert James Chavarria	09/26/78	264/245,250,275,299;
	Clark Berg Foster		473/52
5,649,874	Stephen J. Headford	07/22/97	40/327; 264/239;
			273/Dig.14; 428/13;
			473/569
6,217,806	Donald M. Baxley	04/17/01	264/161,255,273,275;
			264/279.1

(33) International Intellectual Property References:

(None found to relate to the present invention.)

## BRIEF SUMMARY OF THE INVENTION:

(34) The present invention may be summarized as a transparent billiard cue ball with an opaque inner core to be used for training and aiming purposes primarily when attempting to apply sidespin and limit deflection to the cue ball, and secondarily to focus on the ball's precise center when applying no spin. In accordance with the above thesis, it is an object of the exemplary design to improve a billiard player's cueing technique and maintain consistency thereof, where heretofore training balls have remained delinquent.

(35) Primary advantages of my billiard training ball:

(36) The ball trains the player to aim at a central core of optimum diameter, or more correctly phrased, "an image of a central core," in order to minimize lateral cue ball deflection after striking while implementing sufficiently effective sidespin (refer to Fig. 3). I stated the "image" of the core because of the illusory, yet existent phenomenon of light refraction. For example, if I determined that the optimum inner core should appear 26 mm in diameter, the tangible inner core in reality would be designed smaller, about 18 or 19 mm in diameter. The refraction of light through the ball's curved transparent outer shell will magnify the image of the inner core, approximately one-and-a-half times, and cause the inner core to appear larger, in exactly the same manner as with a common magnifying glass. Whereas the refraction of light may be a critical design consideration, whether illusory or not, it does not conflict with the inner core's feasible aiming rationale.

(37) The above mentioned hypothetical inner core diameter appearance of 26 mm, which expectedly has a radius of 13 mm (i.e., the diameter of a typical pool tip) is not an arbitrary guess. Most pool and carom billiard players use cue tip diameters sized from 11 to 14 mm, that compute to a mean diameter of about 12.75 to 13 mm.

(38) The deceased legendary champion, Willie Mosconi, in his classic book "*Willie Mosconi on Pocket Billiards*" stated that, "Most billiard authorities insist that all the English necessary for 99 percent of billiard shots can be applied by striking the cue ball no more than a cue tip-width from the exact center of the ball." Then he summed it up with, "My experience in 15 years of world's championship play convinced me that the cue-tip-width-from-center-of-the-ball rule is right." Many great players today religiously adhere to this premise, like the more recent dominant World Champion, Mike Sigel, who has stated as such many times over the years in *Billiards Digest*. In his column in the

August, 2002 issue, he echoes Willie Mosconi's above theorem with, "... I like to use only about 1/2 to 1 tip's-width left or right of center for much better accuracy to pocket the ball. That's all the English you would even need for ninety percent of position shots, using the rails." He then apprises, "Using extreme English on a tough shot is a very dangerous decision for anyone." Steve Mizerak, a very well-respected champion himself, recently expressed that, "Mike Sigel is the best player breathing on earth." Willie Mosconi is considered by most players to be the greatest pool player that ever lived. I am confident that the superior expert agreement of both Willie Mosconi and Mike Sigel further validates the practical concept of my billiard training ball with an optimally sized inner core.

(39) The ball also trains the player to aim at the image of the central core in order to assist the player in determining the absolute center of the cue ball when not applying sidespin to the cue ball. While the present invention is particularly useful when applying sidespin, it could still help narrow a player's field of vision to focus on a smaller central zone, like a bull's-eye does within a target for archery.

(40) The ball allows the player to continuously practice without stopping to re-align the cue ball with every shot, thus simulating normal play and affording the player the opportunity to maintain uninterrupted concentration to improve skill.

(41) The ball allows the inner opaque core to be made of a substantially dense material in order to compensate for any lacking weight of the transparent outer shell, thereby bringing the cue ball to an acceptable customary total weight. Totally transparent cue balls are nearly 25% lighter than standard professional opaque cue balls. Dense materials such as steel or lead that are at least 25% heavier than a transparent material such as acrylic would readily compensate for lost weight, thereby bringing the training cue ball to within a regulation range, regardless of ball size.

(42) The ball allows a perfectly centered inner core to maintain a center of mass that facilitates a cue ball to roll in a true manner without noticeable wobble. This characteristic would equal the rotationally stable roll of a standard cue ball made from a homogeneous material.

(43) Secondary advantages of my billiard training ball:

(44) The ball allows the inner core to be designed slightly smaller for expert players or slightly larger for beginners, so as to match various levels of players' proficiencies.

(45) The ball allows the inner core to be proportionally adapted to differently sized cue balls of various billiard games: snooker balls are about  $2 \frac{1}{16}$  (2.0625) inches in diameter; pool balls are about  $2 \frac{1}{4}$  (2.25) inches in diameter; and carom billiard balls are about  $2 \frac{3}{8}$  (2.375) inches in diameter.

(46) The ball also permits the inner core to be optimally adjusted relative to the cue stick tip sizes employed in various billiard games. For example, snooker cue sticks use an average tip diameter of about 9.5 mm; pool and carom billiard cue sticks both use a tip diameter size about 12.75 to 13 mm in diameter.

(47) The ball lends to the possibility of adopting a small transparent interior shell of a different color or aspect that would appear like a spherical halo around the inner core, acting as a warning or danger zone of increased deflection.

(48) Finally, the training ball's marble-like design does not preclude incorporating conventional two-dimensional aiming patterns within, if deemed beneficial. The inner core and/or the outer covering could include markings to delineate aiming quadrants for inducing spin, or to simply demonstrate the rolling of the ball, with or without sidespin. While occasionally employing these markings would require cue ball re-alignment on each shot, their presence would not prohibit uninterrupted practice when ignoring them and otherwise aiming at the inner core.

#### BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING:

(49) Fig. 1 is a perspective view of my new billiard training ball resting on the playing surface of a standard pool table.

(50) Fig. 2 is a perspective view of the training ball revealing the direct heading it would take from a center-ball stroke of a cue stick.

(51) Fig. 3 is a perspective view of the training ball revealing the generalized sidespin and deflection that would result from an off-center stroke of a cue stick toward the inner core.

(52) Fig. 4 is a perspective view of the training ball revealing the generalized increased sidespin and widened deflection that would result from an off-center stroke of a cue stick toward the outer covering.

(53) Fig. 5 is a perspective view of the training ball aligned with two object balls, revealing the long-range deflection that would result from an off-center stroke of a cue stick toward the outer covering. (N.B., Sidespin is not depicted in this drawing in order to emphasize the long-range effect of deflection only, even though increased sidespin would be generated on the cue ball in this case, as in Fig. 4.)

#### DETAILED DESCRIPTION OF THE INVENTION:

(54) Reference numerals for drawings 1 – 5:

6	billiard training ball
7	opaque inner core
8	transparent outer covering
9	circumference
10a,b	object ball
11	cue stick (i.e., portion thereof)
12	standard pool table (i.e., portion thereof)
13	planar surface
14	right side rail
15	right corner pocket
16	end rail
17	left corner pocket
18	left side rail
19a,b	sidespin
20	direct alignment
21a,b,c,d	direction of deflection
$\alpha$	angle of deflection
$\beta$	angle of deflection
$\theta$	angle of deflection

(55) The above features and advantages of the present invention, a billiard training ball, will become more apparent and be readily appreciated through the following detailed description of the preferred embodiments taken in conjunction with the accompanying drawings:

(56) Fig. 1: A billiard training ball **6** is shown in perspective view with a portion of a cue stick **11** poised and aligned for a pool shot with ball **6** and an object ball **10a** toward a right corner pocket **15**. For illustration, balls **6** and **10a** are shown as disposed upon a portion of a standard pool table **12** having a planar surface **13** supporting them. Balls **6** and **10a** have a generally spherical outer surface, as shown by an equal circumference **9**. Ball **6** features a centered opaque inner core **7** and a transparent outer covering **8**. Looking additionally to Fig. 1, wherein table **12** is shown having surface **13** bounded by a right side rail **14** and an end rail **16** that include pocket **15** between them;

(57) Fig. 2: Ball **6** is shown in perspective view on table **12** with cue stick **11** poised and aligned for a shot with balls **6** and **10a** toward rail **16**. For illustration, balls **6** and **10a** are shown as disposed upon table **12** having surface **13** supporting them. Balls **6** and **10a** have a generally spherical outer surface as shown by their equal circumference **9**. Cue stick **11** is aimed in a direct alignment **20** with balls **6** and **10a**. Cue stick **11** is also centrally aimed toward the bottom of core **7** through covering **8** and hypothetically imparts force upon ball **6**, as with any typical pool shot. The drawing demonstrates a straight deflection direction **21a** resulting from such force that coincides with alignment **20**. Looking additionally to Fig. 2, wherein table **12** is shown having surface **13** bounded by rail **14**, a left side rail **18**, and rail **16** that include pocket **15** and a left corner pocket **17** adjacent to them;

(58) Fig. 3: Ball **6** is shown in perspective view on table **12** with cue stick **11** poised and aligned for a shot with balls **6** and **10a** toward rail **16**. For illustration, balls **6** and **10a** are shown as disposed upon table **12** having surface **13** supporting them. Balls **6** and **10a** have a generally spherical outer surface as shown by their equal circumference **9**. Cue stick **11** is aimed parallel to alignment **20**, and left-of-center at core **7** through covering **8** and hypothetically imparts force upon ball **6**, as with any typical pool shot. The drawing demonstrates the generalized resultant effects from such force of both a sidespin **19a** and a skewed deflection direction **21b** to ball **6**. An angle of deflection  $\alpha$

represents the constant angle formed by deflection **21b** with alignment **20**. Looking additionally to Fig. 3, wherein table **12** is shown having surface **13** bounded by rails **14**, **16**, and **18** that include pockets **15** and **17** adjacent to them;

(59) Fig. 4: Ball **6** is shown in perspective view on table **12** with cue stick **11** poised and aligned for a shot with balls **6** and **10a** toward rail **16**. For illustration, balls **6** and **10a** are shown as disposed upon table **12** having surface **13** supporting them. Balls **6** and **10a** have a generally spherical outer surface as shown by their equal circumference **9**. Cue stick **11** is aimed parallel to alignment **20** and eccentrically left-of-center at covering **8** outside of core **7**, and hypothetically imparts force upon ball **6**, as with any typical pool shot. The drawing demonstrates the generalized resultant increased effects of a skewed deflection direction **21c** and sidespin **19a** augmented by a sidespin **19b** that would result from such force on ball **6**. An angle of deflection  $\beta$  (wider than angle  $\alpha$  of Fig. 3) represents the constant angle formed by deflection **21c** with alignment **20**. Looking additionally to Fig. 4, wherein table **12** is shown having surface **13** bounded by rails **14**, **16**, and **18** that include pockets **15** and **17** adjacent to them; and

(60) Fig. 5: Ball **6** is shown in perspective view on table **12** with cue stick **11** poised and aligned for a shot with balls **6** and **10a**, and an object ball **10b**, toward rail **16**. For illustration, balls **6**, **10a**, and **10b** are shown as disposed upon table **12** having surface **13** supporting them. Balls **6**, **10a**, and **10b** have a generally spherical outer surface as shown by their equal circumference **9**. Cue stick **11** is aimed parallel to alignment **20** and eccentrically right-of-center at covering **8** outside of core **7**. The hypothetically imparted force on ball **6** from cue stick **11** would produce a generalized deflection direction **21d**. This skewed path of deflection **21d** is theoretically shown passing through closer ball **10a**, then going on to pass by farther ball **10b**, thus demonstrating an ever widening path away from alignment **20**. An angle of deflection  $\theta$  (about twice as wide as angle  $\alpha$  in Fig. 3 and similar to angle  $\beta$  in Fig. 4 depending on any additional variables) represents the constant angle formed by deflection **21d** with alignment **20**. Looking additionally to Fig. 5, wherein table **12** is shown having surface **13** bounded by rails **14**, **16**, and **18** that include pockets **15** and **17** adjacent to them.

**DRAWINGS:**

Five separate drawings are included: Figs. 1, 2, 3, 4, & 5.

**OATH OR DECLARATION:**

Completed forms attached: PTO/SB/01 (10-01); and

PTO/SB/01A (10-01) pages 1 & 2;

(Forms PTO/SB/02, PTO/SB/02A, and PTO/SB/02B are not applicable.)

**SEQUENCE LISTING:** Not Applicable.